FINAL REPORT ON A PILOT PROJECT INTO THE USE OF CELL-DATA FOR CONNECTIVITY TO TWO RURAL SCHOOLS IN SOUTH AFRICA A REPORT PREPARED FOR THE IDRC

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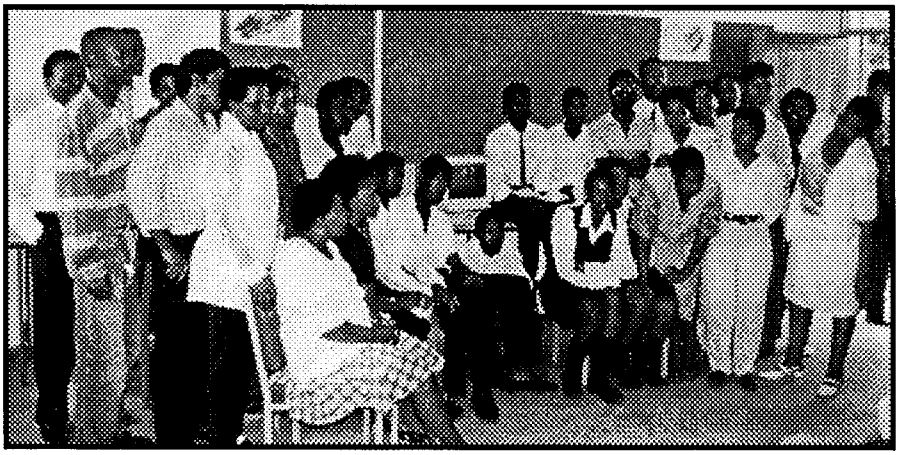

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PREFACE

Context
This report focuses on the use of GSM (Global System for Mobile Communication is a rough translation from the German) for e-mail data communications at two rural schools.

There is a real danger that access to information and information tools will form a new class of *top dogs* and those who do not have access will become *underdogs.* In most African countries it is the rural people who are most in danger of being the *digital underdogs.*

Modern technology is able to bring people from different continents together in productive relationships - but the same technology is often not available to reach communities who live within an hours drive from our cities. The superhighway bypasses many rural villages. There are many who live near the main motor ways and major cities who need access routes to this *information* highway. Currently there are about 75% of the 30 000 schools in South Africa that do not have telephones. Most of these are in the rural areas. This research project is in the context of a number of initiatives, particularly by the IDRC (International Development Research Center) , that aim to address "data" connectivity needs of the more remote communities.

Touching other areas
Working with cell modems has opened up a new world of opportunities that we were not aware existed. Each day the headmaster of Micha-Kgasi packed up the school's one and only computer and the Siemens M1 cell modem and took it to his school. At the end of the day he took it home again where he was able to continue with his work. The mobile nature of this technology made it possible for the headmaster to demonstrate the system at functions and meetings. It was so much easier for him to motivate and show others what can be done and how simple it is to be in communication with the world. It also possible for the support person to do much of the configuring and testing at his home - and other support could also be done at the most appropriate place.

This research project also provided much of the energy that was essential to get PretNet's SUN file server (called Kontiki) up and running. The technical report by Bob Jolliffe (see Chapter 6) has also brought to light a number of problems and potential problems that are experienced by all schools using e-mail and they have given us some tools to overcome them.

GSM is designed primarily to meet voice communication needs of people who as part of their work need to be *on the move.* There is a growing awareness of the importance of the support and marketing aspect of networking and the use of data. This pilot project has opened up our mind to how marketing and support can be improved with greater mobility that cell data affords and so bring communications technology to where it is needed. Normally schools tend to be conservative and lagging behind business but in this area we seem to be breaking new ground.

Method: Action Research
There are times when is it appropriate that the researcher tries to make himself as invisible as possible - like a fly on the wall. This research project falls in the opposite camp as the researcher is very visible and part of the whole process. The "Action Research" approach was an appropriate method of research for two main reasons. Firstly there is no other research work that has been done in this area, and secondly it is unlikely that we would have the resources to employ a separate project co-ordinator, project manager, technician and trainer and then a researcher to evaluate the process and the outcomes.

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Executive Summary

The IDRC (International Development Research Center) was impressed with the progress of various local (South African) initiatives to extend e-mail connectivity to teachers and students in historically disadvantaged areas. A relationship was built up between Christopher Geerdts of the IDRC, and PretNet, the Adopt-A-Network project and the Western Cape Schools Network. Out of this relationship a project emerged which has simultaneously assisted two schools whose ambition it was to explore e-mail projects with other schools around the globe and at the same time gained valuable research data. The one school, Micha-Kgasi, had only a stand-alone computer, and the other, Prestige College, a LAN (Local Area Network).

Neither school had access to a telephone line, but both fell within the range of the GSM network. GSM is the communication protocol used by cellular networks in South Africa. A rough estimate is that about 75% of the 30 000 schools in South Africa do not have telephones (land-lines). As there is only one company (Telkom) currently meeting this huge demand it is unlikely that the situation will change in the short to medium term. Currently it is estimated that 2000 schools who currently are without any form of communication could benefit from voice, fax and data communication via GSM technology.

The rapid growth of the GSM network and increasing innovations in wireless data technologies make this mode of "connectivity" an important factor in the future datafication of rural schools in South Africa and increasingly in other African countries as well. Although almost all cellular systems around the world use the GSM digital voice-compression standard (exceptions being the early analogue systems in North America), South Africa was the first country in the world to add data transmission facilities, as recently as September 1995. On the one hand, therefore, the technology is in its infancy. On the other hand, the considerable gains already made indicate that considerable research dollars will go into further exploiting the potential of the data aspects of GSM technology.

The project evolved from a genuine need by the two schools for connectivity, into an opportunity to develop human networking between the IDRC, schools, the school networking community, academic institutions and the cellular service industry. It has also consolidated some empirical data relevant to rural schools, and may pave the way for the development of a turnkey solution for future schools to 'purchase off the shelf' a package that will give them data, fax and voice.

GSM Data/Fax modems (Siemens M1 Module) were purchased for each of the two schools. A service provider of each of the two GSM operators in SA was approached (via dealers) to take out "air-time" contracts with a credit of R 3 000 (CAD$900) each.

Importantly, the research showed that a reliable and stable e-mail link can be established and operated by a rural school. This has opened up the door for clinics, mission stations and rural research workers who have a need for data communications. We have also established that that web browsing is possible using the cell modem as well as gaining access to usenet conferences such as *schoolza*.

However, it emerged that a reasonably large amount of technical backup and support (training) is needed. Encouragement, technical support and training is possibly the most critical need for rural schools to be able to become part of the global village.

Hardware and connection costs are far higher than for land-line connectivity, although at distances exceeding 200 km from a point of presence the time-based cost becomes cheaper using the GSM technology. There are ways of getting relevant information (including files and web pages) from the Internet by only using e-mail.

The research has shown a need for GSM dealers to know more about data communication. Out of our relationships with the two main service providers we been made aware of the possibility of schools having the facility to get voice, fax and data -

and for it to be available on a pre-paid basis. Both MTN and Vodacom are thinking of extending their community service to add fax and data to the voice services they are required by South African law to provide through community programs.

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Chapter 1: Background

The seed

For a number of years the researcher had been working on ways to extend the benefits of connectivity to rural schools. At the same time, the IDRC had embarked on a number of activities which presently form the kernel for its sub-Saharan initiative known as the **Acacia Initiative**, which aims to include even the most remote and most disadvantaged communities in the discussion and benefits of the rapidly emerging "Information Society". These two interests converged to give initial impetus to the project.

One particular school, Micha-Kgasi High School, had tasted some of the "benefits" of connectivity through their headmaster who had an e-mail link at his home. This particular school had no land communication lines (i.e. Telkom) and almost no hope of getting them! However, MTN (one of the country's two cellular networks) had installed an "MTN Community Phone" at the school, and the awareness that cellular connectivity was possible inspired this *cell-data* project.

A second school, Prestige College, had waited for over 10 months to get a Telkom line and although the area is serviced by Telkom, the limited number of available lines and the backlog in their service gave rise to the question "is there not another way we can link into the benefits of the information highway now, rather than some unknown time in the future?". They too became part of this pilot project.

The two schools were ideal mainly because they were both prepared to participate enthusiastically and contribute to the project. In some ways they were similar, for example they are both about 50 km from Pretoria, both in rural areas and both wanted to become part of the "Global Village". They were also very different in many ways! Micha-Kgasi is in the North West province with about 550 pupils from Grade 10 to 12 mainly from a local village and very few, if any, of the pupils come from wealthy parents. Its existing computer equipment was a single computer on loan. Prestige College is about 50 km North of Pretoria in the Gauteng Province, it is a semi-private school with about 700 pupils from Grade 1 to 12. Although school-fees are about 10% of the traditional private schools, parents of these pupils generally do have some income available for education. Half of the pupils are boarders and so many come from the more remote areas. The school had an existing LAN.

Getting role players together

St Alban's College (a private school for boys), through Grant Nupen, the director of development, had initiated a project in Mamelodi called the Adopt-A-Network project. The aim of this project is to extend connectivity to the Internet in the townships by establishing networks. St Alban's College undertook to administer the project and appointed Yorke Rodda as project co-ordinator and manager as well as the person responsible for the research aspect of the project.

Part of the strategy to improve the quality of the research and to make the findings acceptable to the main role players in related fields was to involve as many of these main role players as far as possible. The "Adopt-A-Network" project, PretNet (Pretoria Education Network) and the WCSN (Western Cape Schools Network), in particular the founder, Stephen Marquard, were asked to play roles that were relevant to their situation. The HSRC's (Human Sciences Research Council) Zakes Lange and Pieter Conradi gave valuable inputs to the research

document. We also aimed to include the two sole cellular network operators, Vodacom and MTN, as well as the suppliers of cell-data equipment and the dealers.

Regular newsletters were e-mailed or faxed to people who had an interest in the project. There were seven of these project "updates" and the number of interested people grew to about 28. There is also a list on a "mail list server" with about 32 e-mail addresses on it.

Hardware Selection for the Project
One of the key success factors in the project was the correct choice of hardware. At the start of the project two options were available (although others are now on the market). These were:

- PCMCIA Card (an interface between a cell phone and a computer, usually a notebook)
- M1 Module (a cell data/fax modem made by Siemens).

Currently, notebook computers (costing between R 6 000 and R 25 000) are almost the only computers that link to the GSM networks for data. In addition to this expensive computer one would require a PCMCIA card (R 2 500), a GSM phone with data capability (R 2 000) and a cable and accessories (R 500). [Approximate currency conversion is 1 CAD$ = R3.30].

The "Siemens M1 Module" is a GSM modem that links directly to a PC without the need for a cell-phone. Currently the cost of the M1 Module is in the region of R 3 500. It has no keys, no screen and looks like a little black box. For a school this is a better option than the PCMCIA Card for the following reasons:

- **Cheap** - compared with other solutions.
- **Dedicated** - it is dedicated to data/fax only - it cannot be used for voice and so it is easier for the staff member in charge to ensure it is not misused for 'private' phone calls.
- **Secure** - it is less attractive and not easy to sell, and is therefore less likely to be stolen. It is also less 'portable' than a cell phone, so less likely to be lost, damaged or stolen.
- **Robust** - it is designed for use in commercial vehicles.

The Siemens M1 Module is only a 2 Watt unit which could reduce it's range from existing network antennae. However, one can gain better range than with a cell phone, by connecting the M1 to a low-cost, high-gain antenna (approximately 10 dB gain for R1000).

The Siemens M1 Module is not supplied with a power unit, an antenna or a RS232 cable (with a 9 pin male on one side and 9 pin female on the other). The problem relating to the power was solved by taking a power lead from the PC's power supply. The RS232 cable and the antenna were supplied by the dealers at no extra cost - but normally these accessories together would cost less than R200.

Dealing with *dealers*: problems relating to "air-time contracts"
It was decided to use dealers who would be willing to go out to the schools and provide support. They both proved to be very supportive of the project and made every effort to be of service - but neither of them were data specialists. Both the dealers (see list of contact people and addresses) are now in a position to offer a better data related service through this research.

Missing out on the service of the *service providers*
There only two network operators, MTN and Vodacom. Under each of these there are a number of "Service Providers", like M-Tel and Vodac (possibly the two largest) and then below the "service providers" are a few thousand dealers.

We discovered through discussions during this project, that at the level of the "Service Provider" there are individuals who are extremely capable and willing to help in the area of GSM data connectivity. It would be advisable to seek a dealer who is not only prepared to give

support but who in turn is supported by one of these "service providers" who have specialists in this area.

Networking with the *network operators*
From the outset it was made clear by the IDRC that they hoped that this research project would result in a meaningful relationship with the network operators. More details this relationship is given in Chapter 7.

PretNet as ISP *(Internet Service Provider)*
Both of the schools are members of PretNet (Pretoria Education Network). PretNet is an association of schools that aims to make meaningful educational use of e-mail and the Internet.

Because PretNet has recently acquired its own SUN file server, called Kontiki (previously we were using a computer at the University of Pretoria), they have a large amount of flexibility and can respond to needs and special requests reasonably quickly. Many of the technical problems that were experienced during the initial phase of the project were related to the teething problems associated with this new host computer.

Software
The software program we used for e-mail on the stand-alone PC is called THURN and the one used to connect a LAN (Local Area Network) is a software program called UUPLAN. They are technically a suite of programs that use UUCP (UNIX to UNIX Copy Program) and Pegasus Mail. Both of these were developed by Stephen Marquard from the Western Cape Schools Network.

The Siemens S1 Module uses a standard communications protocol (Hayes). There were almost no major problems initializing the modem and configuring it to work with the software.

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Chapter 2: Estimation of the impact on rural connectivity

There is limited empirical date to make an estimate of how many schools would use this method to 'get connected'. Here are some background points:

1. Only 1% of schools in South Africa are connected anyway. There are many other constraints apart from telephone connections.

2. As many as 75% of the 30 000 schools do not have telephones (i.e. 22 500). This is based on a loose extrapolation from the four areas, which may not be accurate, but the author believes is as good a figure as is presently available.

3. Maps of GSM coverage are approximately A4 size, so the resolution is not sufficient to determine which areas are covered. Vodacom presently has the facility to determine from its GIS on a case-by-case basis whether or not a school has coverage (digital prediction), but will not release it's national coverage data as an electronic file, for commercial reasons.

Using maps plotted by the HSRC, standard published maps from the GSM networks, and the extrapolation mentioned above, it was calculated that about 2000 schools without telephones fall within existing GSM coverage.

It is likely that there would be pockets of schools utilizing this technology. This would be in areas close to National Highways, almost all coastal areas and around tourist areas such as

the Kruger National Park. These areas are near centers of economic activity, but are nevertheless often extremely under-developed in their own right.

To add to this, there are areas which do not have a local point of presence, and there are some areas in which the phone lines cannot sustain a modem link reliably i.e. where Telkom lines are only just good enough for poor voice communications but not for data.

Much will depend on relative costs, other radio solutions (and these seem to be emerging at a rapid rate) and basic level of computer literacy and communication skills in the schools. Again, one would have to consider possible uses in other rural institutions such as clinics.

Summary of schools with and without telephones in four provinces (Eastern Cape, Free State, North West, North Cape):

No Telephones	9595	75%
Telephones	3136	25%
Total:	12731	100%

(Source: Brenda Kuiters, GIS Unit, HSRC Pretoria)

Extrapolating these results to the rest of the Provinces would give an estimated table as follows:

No Telephones	22500	75%
Telephones	7500	25%
Total:	30000	100%

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Chapter 3: List of other possible technical solutions that were investigated

There are 3 options for connectivity. These are dealt with in turn:

1. Land lines:

This is currently the most affordable solution for schools which have telephones. Many schools are far from local points of presence, and this is an issue which could be investigated separately. This project deal specifically with schools which cannot practically use land lines.

2. Wireless

This is a technology which is presently expensive, but one is mindful that it is worth setting up systems now that can take advantage of emerging technologies and trends.

Of the three wireless systems considered, the first two (packet and spread-spectrum) require a close enough hub transmitter which the schools can connect to. This hub has to be supervised, and has to have its own connection to the Internet, typically via a dedicated land line connection which would cost at least R5000/month or more for the minimum of 64kbps bandwidth. These solutions may be useful when there are a number of potential recipients within a small geographic area, who can share the initial and ongoing costs. These solutions generally have high startup and fixed monthly costs, but the charges are not linked to airtime as such. They therefore become more cost effective when the on-line times are higher, i.e. for web browsing as opposed to e-mail usage.

2.1 Packet Radio

Distances can be as far as 500 km but very high initial investment of R36 000 per site for two sites is needed and there is a low data capacity. This will probably be a feasible option in the

near future, as cheaper solutions come to the fore. There is a possibility that the IDRC will test this at a project in Port St Johns, Eastern Cape.

2.2 Spread-spectrum

Systems such as CiDS (Community Information Delivery System) that has been developed by the CSIR is currently being used at MTC (Mamelodi Teachers' Centre) and SOS Children's Village in Mamelodi. This requires a transmitting station to be established nearby, and the range of about 7 km from the base station seems to be too limiting for rural schools that are reasonably far apart. This technology is currently being refined and developed. This is the technology of choice in areas without telephone lines where it would be feasible to install the transmitting system, as it has a high bandwidth (up to 2 Mbps) allowing web access at reasonable time-costs. One is talking about a greater lead in time, and a greater orchestration of users to create the critical mass to justify the costs of setting up the hub..

2.3 Cellular

This system could be readily installed using the equipment discussed and activated at short notice. The airtime costs are relatively high, but they include network administration, and connectivity is provided via the same servers that form part of the existing school networks. In any event, for Vodacom subscribers the airtime includes free Internet connectivity if this is required.

3 Satelite

For e-mail usage, two e-mail store-and-forward satellite systems could have been used - Vitasat and Satellite. However, Telkom has a monopoly on communications at present, and a special license would have had to be obtained. The systems require more expensive initial hardware, higher monthly rates and specialized expertise, and were therefore not considered above cellular.

Telkom does have a satellite system available, which can carry Internet traffic. However, this only becomes feasible when significantly greater bandwidth and its utilization is required.

In summary, it seems that for now, the GSM route for data communications is the cheapest way to get a reliable and stable e-mail link for those who fall within the GSM and where Telkom is not able to provide an adequate service. For those outside both the GSM coverage and Telkom's service the solution seems to be to use expensive transmitters and receivers, dishes, special hardware and software and possibly some development as well. These all need further investigation.

Further reading on alternative wireless solutions can be found on www.idrc.ca/acacia/studies/ir-jensen.html by Mike Jensen

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Chapter 4: Cost comparison

The following five points indicate the relative costs of this form of communication.

- Currently the GSM fax/modem is more expensive than the use of land-lines.
- GSM modem is about 4 times the cost of the standard modem.
- GSM monthly rental about 3 times the cost of a Telkom line.
- GSM air-time is about 13 times Telkom rates for local calls (less than 50 km away).
- GSM rate of data transfer is theoretically about half the speed of Telkom.

The trend seems to be a gradual increase in the Telkom rates but the GSM air-time costs seem to remain stable and are even possibly going down. Currently, for those areas that are

more than 200 km away from a point of presence, the cost of GSM air-time is the same as or less than Telkom rates . There is a world-wide trend to move away from the use of expensive copper lines to using wireless methods of communication. The high rate of theft of copper wire is another problem that this will address.

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Chapter 5: Technical Issues; rate of throughput, school statistics

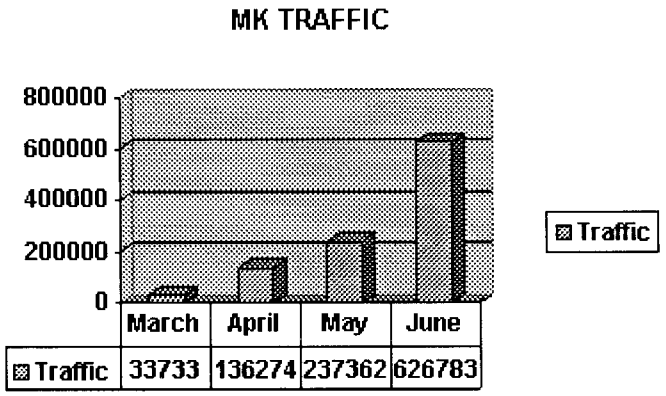
The full report was done by Bob Jolliffe, a consultant and UUCP expert and it can be accessed by clicking on the title above.

The following two things are of interest to all school networks - not just those schools using cellular data.

1. There is a great benefit if schools' traffic is monitored so that problems can be identified as soon after they arise. (This benefit is easily gained if schools work together to perform the function of an Internet Service Provider.)
2. Efficiency of most of the schools can be greatly improved if large chunks of mail are sent at a time rather than frequent sending of small amounts of data.

The following are key points that come out of this report

- data throughput of the two schools using cell modems is in line with other users on the system
- differences in speed from one school to another can be explained by the amount of data per call, (correlation of .7), with larger "chunks" of data being much more efficient
- the protocol that is used is based on UUCP, it is very stable and suitable for this sort of application - but faster throughput could be achieved using tcp/ip connections rather than the default UUCP protocol (as most PretNet users use when dialing into a router at the University of Pretoria). The error correction built into the tcp/ip is more efficient than the UUCP type of error correction.
- the automatic dialer (called *cron*) proved to be very stable and helpful on the LAN as this could be set and allowed to run at fixed times at night
- security on the account using the *cron* was not good and the pupils were able to set it to dial more often - giving an indication of both their technical ability and their keenness to get more mail. This resulted in a number of log ins that did not result in any mail coming in or out.
- at one school (not one of the pilot schools) there was a "runaway" cron with more than 3 000 more calls that were waste to the *cron* not being set up properly. This powerful tool needs to be used with care.
- there was an a very clear growth in the traffic over the five months - in the case of Micha-Kgasi it was 100% per month (Graph below by Bob Jolliffe illustrates this very well).



Is is clear that good use is being made of the e-mail by the current PreNet schools but there is capacity for between 10 and 20 times the number of schools.

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Chapter 6: Training, Educational Use, and Impact

Training at the two schools

The first course was held during the holidays just before Christmas. It was attended by two teachers from each school - and the researcher was aided by David van Suilichem, a computer teacher at the most active PretNet school and the technical director of PretNet. The course was held at Prestige College. During this session we loaded the UUPLAN software and the THURN software and this was also incorporated into the course. We went through the basics sending and receiving mail to each other. This was about 2 hours long and another hour having lunch together afterwards also afforded a time of sharing. A special feature of this was that we saw peer to peer training at its best as this was building relationships as well as transferring skills. Very weak typing skills of some of the teachers meant that they were a little embarrassed seeking and pecking at the keyboard and this stifled the use a little.

Two more sessions were held at the separate schools in the first two weeks of 1997. These were also about 2 hours each giving a total of approximately 6 hours of training. The training was very difficult to do at Micha-Kgasi where we had to share a single computer - and where the 8 pupils came from a range of ages from Grade 10 to 12.

Below are the categories of what was covered:

- **End users** - simply how to use Pegasus Mail (e.g. send, receive, delete old messages)
- **Mail System Operators** - the use of the modem, how to dial out and look at logs, set and activate the scheduler and
- **Supervisors of the Network** - how to create new users, and, in the case of the LAN, put them into the EMAIL Group.

The training was obviously adequate as the staff and pupils were able to manage the mail without any problems - or in the words of one of the teachers "we were able to do things better than we expected". Spreading the training over a period with at least a week between sessions and having two hours a session seems to work well.

Now - almost 6 months later - the teachers are ready to have another "training session" and in particular they would like to know how to save a message to a file so that it can be used later in a word-processor. One teacher said that only now are they ready as there is a limit to what

one can take in at any one stage. Other skills like how to attach a file to an e-mail message, creating and using folders could also be taught at this stage but they would not have been ready for it in the beginning.

Training is always more effective when the trainees have identified a need. This is know as the *need to know* principal. It is also important to give users time to *get a feel* of the technology and this is especially important for the adults. *Holding their hands* too long can inhibit users becoming independent. We could call this principle a need for time for independent discovery.

Educational use

Prestige College

Prestige College moved a very similar amount of traffic (1106 kb) to four reasonably established users during the period under review (a total of 76 days with about 24 days where the pupils are on holiday.) The most significant project was a science project initiated by a Grade 11 pupil on rainbows. This project did very well at science expo. and she gave most of the credit to her e-mail contacts as her source of information - although she also used other resources. Most of the 11 computer monitors (a group of Grade 11 leaders) made numerous "key-pals" with the most being made by Berrend, a pupil at the school, who had 30 different people he corresponded with! Some of the pupils often asked to have access to the computer room during break to use the e-mail.

One of the primary school teachers got involved with corresponding with a school in Adelaide, Australia. This project is going to be continued in the next term.

A few of the teachers used the e-mail for personal reasons - like arranging an overseas tour or getting in touch with family overseas - but only one of them did a curriculum related project. This was initiated by a 12 year-old girl in the USA who wanted people to measure the PH of the natural water in their area to see if there were any signs of acid rain. Her final reply to the teacher can be seen in Appendix C.

It is a common problem in most schools that the telecommunications tend to be avoided by a large majority of the teachers. Prestige College was no exception - although the fact that the mail was dialed out and in automatically every night made it much easier for teachers to use the system.

This school will be creating their own home page that will be found at the following URL: http://www.pta.school.za/pc

Micha-Kgasi

Having only a single computer at Micha-Kgasi meant that about half as much traffic (510 kb) was moved during the 76 day period at this school compared to Prestige College, but if we add to this the traffic that went through the headmaster's "Telkom" account (1 400 kb) we have twice as much traffic for this school as Prestige College.

The pupils had very little access to the computer and the teachers not much more. Each afternoon the headmaster would take the computer home for security reasons - but in the morning it would be back again. There school wanted to put marks on this computer and so e-mail was given a lower priority at the end of April '97.

In spite of problems this school was able to be involved with a number of projects such as:

1. 20 old XT were shipped from an Anglican school in Australia to Micha-Kgasi.
2. A project on rape with pupils in communication from a school in Australia called

Bairnsdale College.
3. ***Message of Good Will*** from all over the globe were sent to Micha-Kgasi on Youth Day and put into a booklet.
4. Flowing out of the project above, Grade 8 pupils from Pineland high school, sent messages to Micha-Kgasi High School and the pupils responded. In this case the headmaster had to type in some of the responses as the pupils were not able to type fast enough.

A fuller list of projects is given in the Appendix C

This school will be creating their own home page that will be found at the following URL: http://www.pta.school.za/mk

Level of support needed by the schools and level of independence

The schools reached a larger level of independence than would be expected for three reasons:

1. more support was given to the school than a normal ISP
2. each school had a member of staff who was computer literate
3. all the people involved knew that they were pioneers and they responded very positively to the attention they were getting, i.e. a classical Hawthorne effect!

There were a total of about 6 support calls after the training had been given. When the hard disk crashed the researcher took the PC of Micha-Kgasi back to the supplier and the disk drive was replaced by a new one - and the e-mail software was reinstalled. The UUPLAN was upgraded to a later version and this led to a number of related problems that needed to be sorted out.

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Chapter 7: Relationship with MTN and Vodacom

Numerous communications were sent to both MTN and Vodacom and we were able to establish who we needed to talk to at each organization. Neither of them at the time felt that the project warranted special attention from them. Our main thrust was to try to get a cheaper rate for all schools and also to make it as easy as possible to have a system where they can pre-pay for air-time. This we have not yet managed to do.

Both MTN and Vodacom see a potential for the Nokia Wireless Local Loop - a devise that can handle voice, fax and data. There is a possibility that a project will come out of the need by the two Network operators to test this device in schools. It is clear that schools that do not have land lines need more than "data-only" and this was all the device we tested (Siemens M1) can provide.

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Chapter 8: Further Research

The following areas of research need to be done, many of which areas were identified in the course of this current project.

1. Providing cost effective solutions for deep rural schools (outside the cover of GSM

operators and Telkom) to "get" connected. Contacts were made via e-mail with three different Christian missionary groups who use a variety of wireless methods for connectivity. It seems that either one needs a reasonably large reserve of hi-tech skills or lots of money to make this a viable solution.
2. The technical report identified ways to improve the efficiency of the e-mail of all users but there could possibly still be room for more improvement.
3. Determining more accurately the viability and size of possible markets (i.e. market research) is needed for this niche is to be exploited by suppliers and schools. One group of potential users are those people who go out with notebooks to rural areas to make these isolated people aware of this technology and what benefits it can bring - as well as those who move around to support schools in these areas.
4. The growing need for school support to use cell data and notebooks seems to be a very important niche that needs to be explored.
5. Making the most efficient use of e-mail by teaches and pupils - how to best train and utilize this form of technology. Much of the energy of PretNet and the WCSN is to make better use of the technology in the classroom.
6. An off-the-shelf solution needs to be investigated, or a way in which the network operator could cheaply add data to the program of extending phones to schools.

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Appendix A: Contact people who helped - with e-mail addresses and telephone numbers

IDRC Contract
Christopher Geerdts, IDRC (International Development Research Center)
Tel: (011) 403 3952 Fax: (011) 399 5050

The Consultant and Author
Yorke Rodda, Computer And Related Education Services
Tel/Fax: (012) 47 6588

National School Data and Some Editing.
Pieter Conradi and Lakes Lange, Human Sciences Research Council
Tel: (012) 302 223 and (012) 302 2405

Schools
Philemon Kotsokoane, Micha-Kgasi High School
Tel/Fax: (012) 542 4077
Nelie Lindeque, Prestige College
Tel: (0127) 210 019 Fax: (0127) 210019
Grant Nupen, St Alban's College
Ron Beyers, St Alban's College and PretNet Chairman
Tel: (012) 348 1221 Fax: (012) 47 1917

Technical
David van Suilikem, PretNet and Pretoria Boys High School
Tel: (012) 462 246 (work) (012) 346 1288 (home)
Stephen Marquard, Western Cape Schools Network (WCSN)

GSM Experts and other GSM Contacts
John Moore, General Manager: MTN Community Phones
Tel: (011) 445 6000
Hans Bosch, Hans Bosch and Associates
Tel/Fax: (012) 45 4044

Chris Chasaburas, GSM renta-phone
Cell: 082 850 3315
Ayob Amed, Vodacom Product Manager
Tel: (011) 322 1000 Cell: 082 990 0150
Hendrina Westoll, Manager: MTN Corporate Relations
Tel: (011) 301 6584 Fax (011) 301 6479
Mohudi Mothiba, Vodacom, General Manager: Community Services
Tel: 082 990 0042 Fax: (011) 322 1139

Dealers
Eckhart Uken, EPS
Tel: (012) 325 8428/9 Fax: (012) 328 6111

Ernette Jacobson, Accessory World
Tel: (012) 348 7863 Fax: (012) 348 2569

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Appendix B: Checklist for those who want to get connected

1. Contact a regional school networking associations- see http://www.school.za.
2. They will advise you on how best to connect - either via a commercial ISP or they will act as an ISP (Internet Service Provider). They will get you connected with software and some basic training.
3. Contact a local cell phone dealer - and make sure he gives you a written quote and that you make it clear you want a data line or a data/fax line. You may want to contact some of the people involved in this research - see Appendix A.
4. We have tested the Siemens M1 Module and it works very well. The Nokia WLL (Wireless Local Loop) should work just as well and this has the added advantage of having fax and voice as well as data. You would get this through your dealer and it should be available soon.
5. Make sure you make provision for an antennae and a RS232 cable as well as a power supply. It is not too difficult to use the power supply of the computer that is to do the mailing.

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Appendix C: Sample of work done by pupils

The note below was sent to the Biology teacher at Prestige College. This was the result of the very first project that the school was involved in.

```
Date:           Thu, 13 Mar 1997 20:35:55 -0600
To:             LB@pclan.pta.school.za
From:           Christa Marx <jmarx@realweb.com>
Subject:        acid rain science project

Thank you very much for helping me with my science project.  Your help was greatly
appreciated.  Without you I would not have won....

First place Award in the 6th Grade in my school competition...
First place Award in the St. Charles/Lincoln County areas for the
```

Physical Science category,....and...
Overall First place Award by the American Chemical Society for all projects entered from Kindergarten through 9th Grade!!

Yes, I did win!

I know that you were probably very busy, so thank you very much for taking time out of your schedule to do this for me. I will not forget what you have done.

I'm sorry I did not write to you sooner, but the second competition was just today. I might be able to enter it into another competition (statewide?) but I won't know until tommorrow.

By the way, if I have not already told you, I have a web page set up with the results. The address is ttp://www.realweb.com/sunshine/science6.htm

I hope that this project has raised the concern of acid rain in our world. I know I have learned a lot and enjoyed meeting each of you that helped me.

Thanks again!!

Christa Marx
6th Grade
St. Louis, Missouri, USA

Below is a quote from a report by the Headmaster of Micha-Kgasi High School. It gives a full list of the projects that the pupils were involved in.

My contact with Yorke Rodda has also led to the International Development Research Council (I.D.R.C) to donate a pentium 100 PC, a desk jet printer and a data/fax cell phone (cell data) to the school. It was actually used to get all the messages from all over the world. It was also used for the following:-

- communicating with St Hildas for the donation of computers.
- water project with an NGO in New Jersey (USA).
- research project on rape.
- reports on cell data project research .
- compilation of quarterly schedules for all classes.
- involvement in the project "Where on the globe is Roger?"
- project on "lets compare prices".
- all correspondence and registrations for the Hungary conference and the Barcelona conference (1997 July).

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Webpage by Christopher Geerdts and Yorke Rodda